Northern Warning Lights : Ambiguities of Environmental Security in Finland and Sweden

Hakala, Emma

2019-04-02

Hakala , E , Lähde , V , Majava , A , Toivanen , T , Váden , T , Järvensivu , P & Eronen , J T 2019 , ' Northern Warning Lights : Ambiguities of Environmental Security in Finland and Sweden ' , Sustainability , vol. 11 , no. 8 , 2228 . https://doi.org/10.3390/su11082228

http://hdl.handle.net/10138/301242
https://doi.org/10.3390/su11082228

sustainability

MDPI

Article

Northern Warning Lights: Ambiguities of Environmental Security in Finland and Sweden

Emma Hakala [1,2,*], Ville Lähde [2], Antti Majava [2], Tero Toivanen [2], Tere Vadén [2], Paavo Järvensivu [2] and Jussi T. Eronen [2,3,*]

1 Global Security Programme, Finnish Institute of International Affairs, 00101 Helsinki, Finland
2 BIOS Research Unit, 00170 Helsinki, Finland; ville.lahde@bios.fi (V.L.); antti.majava@bios.fi (A.M.); tero.toivanen@bios.fi (T.T.); tere.vaden@bios.fi (T.V.); paavo.jarvensivu@bios.fi (P.J.)
3 Ecosystems and Environment Research Programme & Helsinki Institute of Sustainability Science (HELSUS), Faculty of Biological and Environmental Sciences, University of Helsinki, 00014 Helsinki, Finland
* Correspondence: emma.hakala@fiia.fi (E.H.); jussi.t.eronen@helsinki.fi (J.T.E.)

Received: 10 March 2019; Accepted: 2 April 2019; Published: 13 April 2019

Abstract: As the literature on environmental security has evolved and widened, knowledge of the full range of potential consequences of environmental change for different societies remains scattered. This article contributes to a more comprehensive approach to the implications of environmental change by providing a three-level framework of the security impacts. In particular, it will address gaps in knowledge by pointing out the relevance of geopolitical and structural factors behind environmental security impacts. The article will focus on the cases of two countries, Finland and Sweden—both seen as stable, high-income democracies that are well equipped to adapt to climate risks. Yet even under these conditions, preparedness to threat-prevention will not follow without a recognition of the full range of risks, including ones that are linked to socio-economic and geopolitical factors. On the basis of the Finnish and Swedish cases, the article proposes an analytical framework of three categories of environmental security impacts: local, geopolitical and structural.

Keywords: environmental security; security impacts; societal transformation; resilience

1. Introduction

During recent years, the perceived magnitude and severity of different kinds of environmental threats have been on the rise. For example the World Economic Forum annual survey [1] shows that there has been a clear shift from economic to environmental threats between 2009 and 2019. As the severity of environmental problems that the world is facing is increasingly understood, the risks that they pose to societies also become more apparent. Although the impacts endured in different parts of the world will vary considerably, no region will be fully spared from the consequences [2–4]. Environmental security literature has aimed to explore the interactions between environmental change and society in various geographic and societal contexts [5–7].

Analyses tend to focus on regions where environmental impacts are manifest concretely. These tend to also be regions where changes are acutely felt due to their severity, the fragility of local communities or a combination of both [3]. Studies have examined direct security links caused by the interactions between the environment, access to natural resources and threatened livelihoods [8]. These are especially apparent in post-conflict or high conflict risk areas [9,10]. Meanwhile, impacts that are less local and more geopolitical tend to be neglected [11]. In addition, less attention has so far been paid to the security impacts of the society-wide transformations that will be necessary to both mitigate climate change and to adapt to it [12,13]. Key sectors like energy, food production and transportation should already be adjusting to a changing environment while also being restructured to be sustainable

in the long run [14–16]. Moreover, these impacts concern industrialized and developing countries alike and therefore need to be analyzed on a case-by-case basis but in a global context.

Our focus here is on two countries, Finland and Sweden. As Nordic countries, they are exposed to relatively severe climate induced risks, as the impacts of climate change are more profound in the Northern latitudes than the global average [17–19]. On the other hand, as stable, high-income democracies they are considered to be well equipped to adapt to new conditions and therefore not highly vulnerable to the risks [20]. These two reasons make Finland and Sweden excellent case studies to analyse the security implications of environmental change in the context of "stable Western democracies" which should be equipped to deal with the consequences.

We distinguish between two steps that are necessary for preparedness to threat-prevention to follow: the full range of risks needs to adequately be recognised, and deliberate policy measures need to be taken to address them. In this article, we focus on the recognition of risks, which in most cases will need to precede policy-making. Therefore, we identify cases where an explicit link has been made between environment and security and point out linkages that appear to be missing from these analyses. An examination of the decision-making and policy-context is beyond the scope of this paper, but we are developing another manuscript on that theme. While there are several analyses in the literature that consider what environmental security could ideally entail [21–23], we turn to look at what are the issues countries, as security actors, have already recognised. On the basis of our analysis we point out aspects that are, in light of theoretical research, missing from their analyses and that should be taken into account in order to provide grounds for sound policy-making.

The Nordic countries therefore constitute an interesting case where the ability to prepare and adapt to climate change depends more on the level of analysis than on technical capacity alone. In addition, they provide a perspective beyond the direct ecological risks of environmental change, emphasising instead the security impacts associated with the societal transformation required to mitigate and adapt to it. The discussion of two countries instead of only one makes it possible to make comparisons and to identify differences caused by the approaches chosen by the two countries.

The paper will proceed by first giving a brief overview of current environmental security literature, pointing out gaps concerning societal transformations. This will yield the basis of our categorization of environmental security impacts into local, geopolitical and structural ones. Then, we consider the Nordic country cases, outlining the major environmental security threats they are facing and that they recognise in their current strategic assessments. In particular, we focus on the gap in preparedness concerning the adaptation to a world with zero CO_2 emissions. Finally, the paper will conclude by proposing a new, comprehensive framework for more effectively taking environmental security impacts into account.

2. Theoretical Approaches to Environmental Security

As a theoretical concept, environmental security is by no means a neglected topic. Starting with the rise of the wider approach to security at the end of the Cold War, the literature has ranged from environmental causes of conflict [24–26] to the threats of pollution to human health [3]. Due in part to the variety of topics it covers, however, the discussion often runs into ambiguities and inconsistencies with regard to specific impacts on society.

Environmental security literature has traditionally been divided between two major strands, one focusing on conflict and the other on human security. What a majority of the research suggests, however, is that environmental security usually is closely linked to societal and political factors and is virtually impossible to reduce to straightforward causal relations. Conflicts, for instance, do not stem from one environmental cause, but may occur when environmental factors are combined with other ones, such as governance [21,27], population growth [28], health [29], migration [30] or excessive resource extraction [31,32]. Human security, on the other hand, considers environmental threats to be linked to various other factors that increase vulnerability, such as deteriorating health, welfare, livelihoods or equality [3,23,33,34].

The indirect character of many environmental security impacts makes their prediction and management all the more difficult. Knowledge about environmental changes has to be combined with knowledge on socio-economic and political developments that are difficult to predict as such, resulting in prognoses so complex and uncertain that their information-value suffers considerably. Moreover, direct impacts that are experienced locally in one place may be felt indirectly elsewhere as a result of geopolitical linkages [35]. If environmental security is able to render these complex connections visible, it can offer a means to examine and potentially resolve environmental problems in a way that takes their cross-sectoral implications into account.

Yet the idea of environmental security as an overarching framework for multi-faceted analysis counters theoretical views that consider it an inherently reductive concept. According to Deudney [36], Aradau [37] and Bettini [38], among others, the linkage to security may lead to the use of force and to politics of emergency. This echoes the securitisation framework first introduced by Buzan, Waever and de Wilde [39], who argue that the introduction of new issues into the security sector will often have the effect of moving them beyond normal democratic discourse. Others, however, question whether this always is the logic emerging from securitisation. Trombetta [40] argues that appeals to security in the environmental sector have yielded new kinds of measures and helped to involve a wider group of actors. For Oels [41], efforts to securitise climate change have given rise to new risk management mechanisms that have had the effect of 'climatising' security rather than vice versa.

In fact, it would make sense to acknowledge the security consequences of environmental change well in advance in order to address them through democratic processes as long as they are still in effect. According to Dalby [42], this is becoming more urgent as climate change advances. Policy-making needs to understand and foresee the deep social, political and economic roots of environmental changes and try to affect them before they erupt as crises, rather than seeing crises as externally caused events. Furthermore, this capacity for foresight will have to be built up simultaneously with a vast societal change necessary to mitigate climate change.

Yet current literature does not adequately take into account the societal challenge of climate change. Some studies have pointed out the potential security consequences of climate change mitigation [43] and adaptation [44,45], but are for the most part limited to direct impacts in local contexts. They also focus on the Global South, where such efforts have been carried out through development cooperation projects [46]. This tendency may help to maintain the false impression that countries in the North will easily be able to deal with the repercussions of climate change that they face [47]. In a more global context, the security impact of mitigation has primarily been discussed with regard to climate geoengineering, which could potentially have significant consequences on ecosystems and societies [48–50]. However, policy discussion about its actual utilisation has so far remained marginal [51].

The focus on direct impacts and specific one-off mitigation actions runs the risk of neglecting the extent to which climate change and its prevention will influence production patterns, politics and societies as a whole [14,15]. This has been noted by Dalby [11], who argues that geophysical factors will increasingly have a role at the core of geopolitics. In terms of policy planning, the attention will therefore have to shift from a traditional focus on military power to issues like energy, food systems and infrastructure. In particular, Dalby highlights the need to acknowledge the economic foundations of environmental problems and a necessity to reconsider current production patterns. Environmental problems tend to transcend territorial state borders, and cannot be defended against with the use of force. They call for coordination, anticipation and foresight rather than a reaction to a threat that has already occurred. In other words, a transformation in geophysical and societal factors will require a corresponding transformation in our thinking about security and its governance [11].

The approaches linking environment to the human security approach offer some pathways to transformative thinking. Through a recognition of the economic, social, institutional, political, cultural, and technological factors, it allows for analyses that set environmental change into its context [52]. As such, it creates an interface between these fields, bringing in actors outside traditional formulations

of security and encouraging interactions between them [53]. As proposed above by Trombetta [40] and Oels [41], it may therefore have a democratising impact on security discourse, as it disperses power from political elites to the wider society. Such an approach has the potential to encourage participatory processes of decision-making, which help to avoid resorting to the kind of extreme measures, such as geoengineering, that Dalby warns against [54]. However, policy discussion about such consequences still remains marginal, as Corry has pointed out [51].

New kinds of security thinking may already be overdue if they aim to reinforce democratic procedures rather than to erode them. As the consequences of climate change become more acute and its prevention more urgent, the potential for the use of force or restrictive measures increases. One of the scholars behind the original securitisation framework, Jaap de Wilde, has observed that the structures of society can either be changed voluntarily and in an orderly manner, or violently and randomly through environmental crises [55]. As long as countries do not adequately take these impacts into account, they are unlikely to fully engage in implementing policies to address them. The key question therefore is how environmental security can be implemented into policy in a measured and premeditated way.

Previous literature shows that environmental security cannot be construed through a single, uniform perspective—on the contrary, it requires a way of recognising the diversity of environmental impacts. This also suggests that analytical tools for environmental security have to be developed and adapted to the needs of individual cases,—although they must also be understood in the context of the wider environmental security discourse. The following section will consider the cases of Finland and Sweden and aim to come up with an analytical framework to examine different kinds of environmental security impacts from the point of view of individual countries.

3. Materials and Methods

The previous sections suggest that it is possible to discern at least three kinds of environmental security consequences that have not all been recognised to an equal extent. Local impacts, such as the physical impacts of storms or floods, are starting to be acknowledged in both theory and policy-making. There also is an increasing understanding of impacts where environmental change is combined with geopolitical factors, although these are more difficult to predict and prepare for in terms of policy. Meanwhile, the impacts of mitigating and adapting to environmental change are still inadequately addressed in the literature and largely neglected in policy-making.

The present study will address the shortcomings of environmental security analysis through the cases of Finland and Sweden. It will examine the environmental security impacts currently taken into account in the strategic planning of the two countries, while also identifing consequences that are not yet adequately recognised. The aim is to formulate a comprehensive picture of the kinds of impacts that Finland and Sweden are facing, but also to consider the strategic relevance given at state-level to the security impacts of environmental change. Our main focus, therefore, stems from the need to understand the extent to which traditional security and foreign policy analysis has been able to change and incorporate new risks associated with a changing environment. Rather than aim to identify every aspect of environmental change that could have relevance for security, we instead direct our discussion to instances where environmental issues have already been noted in security analyses in Finland and Sweden.

Our perspective also determines our data selection. In order to examine the recognition of environmental impacts in strategic analysis, we look at major state-commissioned research papers and policy documents that have a key role in determining decision-making or significant influence on policy discussion. Due to our focus on decision-making concerning security, we have only looked at assessments that explicitly make the link between security and environment. While we do not argue that no other assessments of environmental impacts or climate mitigation measures exist, these do not take into account the areas of security and foreign policy, which are central to our approach. Based on our survey and focus, the main documents which are analysed here are: Sweden facing climate

change—threats and opportunities (2007) [56], Klimatförändringarnas konsekvenser för samhällsskydd och beredskap—En översikt (The consequences of climate change for the security of the society and preparedness, Sweden 2012) [57], Risker, konsekvenser och sårbarhet för samhället av förändrat klimat—en kunskapsöversikt (Risks, consequences and vulnerability to the society from a changed climate—An overview of capacity) (2012) [58], *Klimatförändringarnas indirekta effekter och deras betydelse för Sverige* (2014) [59], Crossborder effects of climate change in Finland (2016) [60] and Weather and Climate Risks in Finland—National Assessment (2018) [61]. In addition, some regional and sectoral assessments [62–67] have been examined to gain a more extensive idea of the risks that have been taken into account and that may also be used to inform policy-making.

To guide our analysis, we rely on the observations made above regarding different kinds of consequences that environmental change may have. It will therefore look at environmental security at three levels: local, geopolitical and structural. *Local impacts* are caused by environmental factors, such as extreme weather, and directed at individuals and the society. In other words, they include impacts on human wellbeing both directly or through critical functions of the society. *Geopolitical impacts* occur as environmental changes are combined with political and international factors. Finally, *structural impacts* are caused by the societal transformations that need to be carried out in order to mitigate and adapt to environmental change itself. The assumption here is that structural changes in the economic and political systems will be required to achieve sustainable and secure societies.

For each category of impacts, our analysis proceeds as follows. First, we examine whether the existing assessments take the category into account overall. Second, we look more closely at the kinds of impacts that are recognised and the consequences they are expected to have. Third, on the basis of our analysis of environmental security theory, we aim to identify gaps in the current recognition of impacts.

The focus of this paper is particularly on the two latter kinds of impacts, which tend to be neglected more than local ones. However, rather than predetermining exact characteristics for the categories, the country cases are used to trace potential impacts. The aim is to give substantial examples of environmental security impacts that often remain vague in policy discussion.

As mentioned above, Finland and Sweden are interesting from the point of view of understanding environmental security impacts in the context of countries that are considered to have low vulnerability [68,69] and high capacity to adapt to climate change [70]. This interpretation, however, neglects the less immediate geopolitical impacts as well as societal transformations that cause structural impacts. The cases of Finland and Sweden thus offer grounds for exploring environmental security more comprehensively than merely in terms of immediate and local impacts. Therefore, they also illustrate the need for a more systematic framework for analysing environmental security in order to gauge the full range of impacts.

4. Results: Environmental Security Impacts in Finland and Sweden

4.1. Local Impacts on Environmental Security in Finland and Sweden

Both Finland and Sweden have commissioned research projects to assess local impacts of climate change on the security of their societies. In Sweden, the main document on climate impacts, entitled "Sweden facing climate change—threats and opportunities", analyses the consequences for various sectors of the society, from transportation to communications, energy and health [56]. The original assessment dates back to 2007, but both the main document and its various attachments have since been updated. In addition to the national level, it also evaluates impacts for individual municipalities or regions [58]. Other authorities, such as the Swedish Civil Contingencies Agency, have produced similar assessments on sectoral impacts [57]. Both Finland and Sweden are also required to assess 'vulnerability, risks and climate change impacts' for their National Communications to the UN Framework Convention on Climate Change (UNFCCC) [62,63]. However, for both countries this section in the report is brief and does not add anything beyond the data in the assessments mentioned above.

In Finland, sectoral impacts have been included directly in a recent assessment of climate impacts. It presents a fairly detailed analysis that also aims to take into account the influence of different future scenarios, although also pointing out the impossibility of covering all potential impacts and interactions [61]. A similar report has previously been prepared on the measures to promote the management of climate risks [64]. Local actors, like the city of Helsinki, have also produced their own assessments [65]. In addition, there are more sectoral assessments, such as a report by the Finnish Climate Change Panel on the expected impacts of climate change on forests, which constitute a crucial economic asset for the country [67].

In both countries, temperatures will rise more than the global average [61]. The change will be more severe in the winter and in northern areas. Finland and Sweden will also experience increased precipitation, potential flooding and other changes in water systems. Overall, weather patterns will become more variable and unpredictable. Both countries will also be affected by rising sea levels and decreased ice cover of the Baltic Sea [56,61].

Both Finnish and Swedish assessments raise the following local impacts on different sectors [56,61]:

- traffic and communications;
- water management;
- health;
- forestry, agriculture, fishery;
- built infrastructure;
- energy sector.

Both Finnish and Swedish analyses point out that the expected impacts rarely pose direct risks to people's lives. They do point out, however, that severe consequences in different sectors are directed to the security of the society. Heat waves, for instance, are expected to have health effects and a rise in average temperature may increase the occurrence of various transferable diseases. Extreme weather, such as storms and heavy precipitation, may threaten energy supply and distribution. Transportation infrastructure and housing are also at risk of floods, storms and other unexpected weather events [57,61].

Based on the research reports, the kinds of local impacts expected for Finland and Sweden can be contained in such a way that they will not necessarily cause significant damage to society. This, however, requires planning and preventive actions. The fact that the research reports and risk assessments have been state-commissioned and publicly funded suggests a degree of recognition of the relevance of environmental security impacts even in the Nordic context. Especially in the Finnish case, the assessments also provide practical insight to the concrete consequences of environmental impacts and suggest ways to manage them.

However, recognition alone does not amount to action. Practical policy measures are required to achieve any kind of preparedness to deal with environmental security impacts. The current presence and implementation of policies for local environmental security impacts in Finland and Sweden is explored in another article written by us [71]. On the basis of the analysis here, it can be argued that an adequate level of knowledge exists in both countries to form the groundwork for policy.

4.2. Geopolitical Impacts on Environmental Security in Finland and Sweden

As the geopolitical impacts of environmental change can be quite wide-ranging, their assessment may often be limited to sector-based analyses. In Finland, however, a recent study was commissioned to explore the 'crossborder effects of climate change' [60]. Meanwhile, in Sweden, one of the updated attachments to the assessment of the impacts of climate change also considers geopolitical impacts. The report calls these 'indirect' impacts, but the discussion is strongly on the geopolitical level. However, the report is careful to point out that it is intended as a brief overview rather than as a comprehensive assessment [59]. In the Swedish case, therefore, an overview of the geopolitical impacts appears to be missing.

On the other hand, a report by the Swedish Environmental Institute presenting a Transnational Climate Impacts Index proposes indicators for country-level exposure to transnational impacts of climate change and thereby provides an analytical framework to guide adaptation efforts. Its scope is global and by no means aimed at examining the Swedish situation in particular [35]. Meanwhile, the Mistra Geopolitics project attempts to examine the geopolitical implications of climate change both globally and from the point of view of Sweden and has devised scenarios to take into account the geopolitical interactions, but at the time of writing it has not published reports on the specific impacts in Sweden [72,73]. For Finland, similar geopolitical research with potential strategic impacts on decision-making does not exist.

In its introduction, the Finnish assessment points out 'chains of events' as a central feature of the transboundary or geopolitical analysis of environmental change. This underlines the indirect connection between local impacts that take place elsewhere and their consequences that are felt elsewhere through geopolitical, economic or other linkages [60]. The Swedish report refers to the same process as 'indirect, cross-border and long-distance effects' [59]. Both assessments therefore emphasise that the countries are in many ways linked to and even dependent on global resource flows and international frameworks, which considerably increases their vulnerability to disruptions in these systems.

The Finnish and Swedish assessments give an outline of potential indirect impacts—also in the Swedish case, as the countries are similar enough in terms of political and structural factors. The reports lists the following issues among those that may have adverse impacts on security [59,60]:

- resources and critical production: price instability, food security, problems in access and supply, damage to infrastructure for trade, passive approach to climate change based on an inadequate risk perception;
- energy: price instability, problems in access and supply, damage to energy infrastructure, rising reinsurance payments;
- international transport: risks associated with new transport routes, damage to transport infrastructure;
- business and finance: uncertainty in global markets, rising reinsurance payments, disruptions in data networks, damaged assets;
- population: unexpected migration flows
- health: new disease risks due to food, population movements and new species;
- biodiversity: risks caused by invasive species e.g. to agriculture and forestry;
- foreign policy: increasing global uncertainty, conflicts, increasing regulation;
- development cooperation: deterioration of the achievement of development goals, increased need for humanitarian relief resources, increased propensity for conflict.

Both reports acknowledge that the intensity of indirect impacts strongly depends on the severity of climate change, but also the development of world economy [59,60]. According to the Finnish assessment, climate change may change competitive advantages between the countries, which will influence the dynamics of global trade. It does not, however, clarify what these changes are in more detail. It may also have physical impacts on critical infrastructure, such as ports and distribution networks, which could cause disruptions on trade routes. This is significant for Finland, where the value of international trade was about 30% of GDP in 2013 and is expected to grow in the coming decades [60].

Yet according to the Finnish assessment, the impacts of climate change on Finnish industry, for instance, will remain small, as most of the source countries of Finnish imports are in Europe, rather than in areas where climate impacts are more significant. Forest industry, which is an important sector for Finland, is noted as a sector that might suffer as over 50% of Finnish forestry production is located in areas of the Global South where production is likely to go down [60]. With regard to energy production, the Finnish report is more ambiguous. While the common Nordic energy market Nord

Pool is described as highly secure and adaptive, climate change might still increase variability and disruptions. Similarly, crucial oil and gas imports from Russia could suffer from interruptions.

The above estimations, however, seem to neglect the full impacts of global warming on the world economy. 2 °C of global warming has been estimated to lead to severe economic losses [74], which in turn is likely to cause at least some degree of global recession. Due to the global connectivity that the assessment also recognises, it is not clear that Finland will be protected from economic and geopolitical impacts, regardless of the geographic range of its trade partners.

The blind spots of the Finnish assessment are perhaps best illustrated by the case of the Arctic region. The report does note that extreme weather events will become more common in the Arctic region, causing risks and requiring new safety measures for transportation. Overwhelmingly, however, it presents climate change as an opportunity for Finnish Arctic policy due to new transportation routes and access to natural resources made available by the melting of the ice sheet [60]. The analysis appears to entirely overlook the global risks presented by the increasingly severe impact of climate change in the Arctic [75]. Moreover, the increased activity and interest in the Arctic has been argued to increase geopolitical risks, including for Finland [76].

The cross-border impacts become perhaps the most evident in the discussion of health and migration. According to the assessment, the 'number and frequency of pathogens may increase in imported foodstuffs' and new diseases will enter Finland also as a result of travel and population movements [60]. In addition, the report notes that climate change may increase global migration. It refers to the 'refugee situation of 2015' which suggests that some of the migration may also be directed to Finland.

Meanwhile, the Swedish report quite extensively acknowledges the global chains of geopolitical and economic impacts. In keeping with its own premises, however, it does not provide a full sectoral analysis, and is more ambiguous on the details of impacts. It notes, for instance, that as Sweden is in many ways integrated into the global energy market, it will also be influenced by its increased instability. The report also notes the risk of an intensified politicisation of energy, which could weaken Swedish energy security [59]. Likewise, the report points out that climate change may have significant consequences on Swedish food security due to global disruptions in production, but notes that the specific form of these impacts have so far not been studied.

The Swedish report points out migration as one of the priority sectors influenced by climate change. It argues that changes in living conditions around the world, as well as potentially rising risk of conflicts will force people to migrate, and some of this movement is likely to be directed towards Sweden. This may put a strain on Swedish social security services and increase pressure on facilitating integration into the society [59]. The Swedish assessment dates back to 2014, so unlike the Finnish one it does not refer to the refugee situation during 2015.

Both reports propose actions for taking geopolitical impacts into account in policy-making. The Finnish one calls for increased cross-sectoral and international coordination, but also suggest that it is possible to develop individual actions in various sectors to address specific impacts. In addition, the report emphasizes the need for a better understanding of the causal chains behind geopolitical impacts, particularly in a global context [60]. The Swedish report mainly calls for further, more comprehensive analysis and assessment to guide policy-making. However, it also recognises the need for cross-sectoral coordination. In addition, it suggests analysing the policies and strategic work carried out in other countries on the linkages of environment and security, pointing out the potential to learn from work that has already been done [59].

The recommendations correlate with the observation made above that there is a lack of recognition of the consequences that geopolitical changes may have on Finland and Sweden, whether in the Arctic, in neighbouring countries or in a wider international context. In other words, both the Finnish and Swedish assessments seem to be correct in pointing out that further research is needed. However, emerging knowledge on the geopolitics of environmental change will only be effective if it is utilised in

policy-making. The extent to which this is the case in Finland and Sweden is discussed in another article written by us [71].

4.3. Structural Impacts on Environmental Security in Finland and Sweden

While the previous sections have focused on the consequences of environmental change itself, the final one discusses the impacts of the measures taken in order to either mitigate it or adapt to it. Even in global terms, the territory is relatively uncharted, but implications especially in the field of energy transition are beginning to be acknowledged [77]. The impacts associated with energy transition are also included in a Hongkong and Shanghai Banking Corporation (HSBC) study tracing the climate vulnerability of countries around the world. Although Finland and Sweden are the two least vulnerable countries in terms of their overall score, they both rank higher in the energy transition section: Finland is 47 and Sweden 56 out of 67 countries, where the first position indicates highest vulnerability [69]. The scores suggest that it may indeed be the structural transitions that pose the highest relative risks to countries like Finland and Sweden.

The Finnish climate impact assessment takes some note of the consequences of adaptation and mitigation on the energy sector. It points out that vast changes will be needed in order to cut greenhouse gas emissions by the required 80%–95% by 2050, and that Finnish development is highly dependent on global changes. However, on the basis of the National Energy and Climate Strategy for 2030, Finland is expected to become more energy independent [78] which would curb the risk of transboundary or geopolitical impacts. Another publicly commissioned study that examines energy transition from the point of view of Finland-Russia relations concludes that the increasing independence will make Finland less susceptible to Russian influence in the energy sector. On the other hand, Finnish dependence on Russian nuclear power is simultaneously increasing, which in turn may hold back the development of renewable energy production in Finland [79].

In Sweden, the geopolitical consequences of energy transition have been under even less scrutiny than in Finland. These are not mentioned in the main document on climate risks, which primarily focuses on local impacts [56]. The analysis of indirect impacts suggests that the Swedish energy sector will undergo changes as the overall European energy market and production balance develop, although it does not explicitly argue this would be due to policies for the mitigation of climate change. It does point out that interest in and demand for Swedish hydropower production may increase [59]. The Swedish Energy Agency has published a study on the transition to a sustainable energy system, but the challenges observed are limited to barriers such as lack of financing [66]. This document suggests that at least at the official level, energy transition appears to be perceived primarily as an opportunity for Sweden.

Moreover, the assessments in both Finland and Sweden are based on a limited perspective in which future changes are expected almost exclusively within the energy sector. The Finnish assessment does note that climate change may give rise to protectionism, although it is not explicitly stated whether this would be due to the policies to mitigate climate change or climate impacts as such [60]. In addition, the assessment points out that the increasing importance of carbon sinks in global climate negotiations might have significant consequences for Finnish forestry. However, it does not clarify what the effects would be like, apart from concluding that demand for Finnish wood could rise as a result of an increasing interest in sustainable forestry and wood-based products [60]. In other words, it does not take into account the possibility that international mitigation policies, such as EU regulations, would require increasing carbon sinks in forests. This would require Finland to reduce wood harvesting, potentially leaving forests as stranded assets for the forestry industry.

Although the Finnish and Swedish assessments attempt to consider environmental change in an interaction with some socio-economic and climate-related factors, they do so within a relatively static economic and societal system. In other words, they expect full the mitigation of climate change and full energy transition to accommodate to the prevailing conditions of the society. Yet, as the theory presented in Section 2 shows, the measures required to prevent environmental change from reaching a

critical threshold have to take place at a systemic level incorporating changes in behavior, governance and economics [16]. It has been argued that the present economic model based on constant growth is fundamentally irreconcilable with rapid cuts in emissions, and effective decarbonisation therefore necessitates a transition of the entire system [80]. Such radical changes, especially when combined with the urgency of taking action, will inevitably produce new opportunities and threats as well as winners and losers both domestically and globally. This may lead to societal instability and shifts in geopolitical relations, thereby creating new security issues. In particular, the transition poses a challenge to democratic decision-making, which needs to be able to rapidly come up with efficient climate policies while also ensuring that they are socially just and acceptable to various groups of the society.

By neglecting the structural impacts apart from some aspects of the energy transition, Finnish and Swedish analyses end up discounting a crucial dimension of the security consequences of environmental change. Assessments based on an analysis of separate sectors will not be able to produce a comprehensive picture of the changes ahead. Although precise predictions are impossible to come by due to the difficulty of factoring in simultaneous changes in different fields, further research can still help to widen our understanding of the dynamics involved. This is also a precondition to providing any insight on the adaptation impacts to aid policymaking.

5. Discussion

The analysis in the previous sections shows that the three-level classification helps to go beyond the usual focus on direct environmental security impacts and to get a more comprehensive perspective. It shows that even for relatively resilient countries like Finland and Sweden, environmental change creates various security issues. In addition, it confirms the expectation that while the level of recognition is good on local impacts and emerging on geopolitical impacts, structural impacts are to a large extent neglected in research and risk assessments.

Table 1 provides a framework for analysing environmental security impacts. Different impacts can be overlapping and simultaneous, and they are related in many ways. Yet the division into three categories makes it possible to see the different dynamics behind them. Local impacts are often possible to anticipate as an interaction of cause and effect, although they might still end up having wide and cross-sectoral consequences. Geopolitical impacts, on the other hand, usually have a crossborder aspect and require an understanding of complex linkages between countries and sectors. Meanwhile, structural impacts are analytically challenging as they for the most part refer to changes that have not yet been implemented.

Table 1. Framework of environmental security impacts.

Local Impacts			
Possible impacts	*Geographic scope*	*Time frame*	*Scale*
Storms, floods, droughts, heat waves and other extreme weather events	Local, regional	Short to long term	Sectoral, cross-sectoral
Geopolitical Impacts			
Possible impacts	*Geographic scope*	*Time frame*	*Scale*
Conflict, migration, food shortages, disruptions in energy production, disruptions in resource flows	Regional, global	Short to long term	Cross-sectoral
Structural Impacts			
Possible impacts	*Geographic scope*	*Time frame*	*Scale*
Systemic shock in energy production patterns, failure of economic production system, erosion of democratic governance	Local, regional, global	Long term	System-level

An understanding of both the different dynamics of the impacts but also the inter-linkages between them can help to come up with ways to address them. For one thing, it shows that environmental security requires both domestic and international approaches. Local impacts may in some cases be possible to address purely through national policies, but geopolitical and structural impacts require an international perspective and foreign policy engagement. Moreover, environmental security at all levels seems to benefit from international cooperation and coordination.

In addition, our analysis suggests that there still is an acute need to go further explore the consequences of adapting to and mitigating environmental change. The current low level of recognition of the structural impacts makes it virtually impossible to produce ways to address them. Although some aspects are starting to be noted especially concerning changes in the energy sector, this will not suffice to perceive the full scale of the transition. Therefore, structural impacts in particular require coordination across sectors.

6. Conclusions

We argue that while local security impacts in the Nordic countries are relatively limited, it still is imperative to have an understanding of environmental security in the comprehensive sense. There are multiple geopolitical impacts and tipping points in the global system that will influence the Nordic countries as well. Although it is, at present, difficult to accurately predict the patterns that these factors will lead to, this should not be a reason for not taking them into account. On the contrary, it should prompt further inquiry.

What all environmental security impacts have in common is that while they undeniably influence the security of the society and individuals, they cannot be understood strictly as a matter of security policy in the narrow sense. They call for taking into account the security impacts of environmental change through risk assessments and preparedness while also integrating political, economic and societal perspectives. In other words, environmental security needs to be to some extent inclusive, thereby setting it in contrast with traditional formulations of security as a restricted sector, as discussed in Section 2 above. Yet this is not to argue that the entire security sector should be opened up. Our suggestion is to start interactions between security and various other sectors in the environmental case. This echoes the previously presented points by scholars like Trombetta [40] and Oels [41], suggesting that the security sector also needs to adopt new modes of action in the face of new threats.

The previous points become particularly compelling as environmental security discourse moves beyond the recognition of local impacts to acknowledging those associated with structural changes in the society. The transformations in energy and economics take place at a systemic level, and are highly unlikely to take place in an orderly manner without governance. The question is how to implement adequately effective and fast changes through the relatively slow democratic process. Yet at the same time, democratic governance is invaluable as a way to ensure that the transformations are equal and just. While it does not in itself work as a definite guarantee against discontent or instability, democracy provides the means to deal with them through open, participatory processes. In this context, the environmental security approach should aim to support decision-making by providing anticipatory insight into the society-wide and geopolitical implications of the transformation.

Author Contributions: Conceptualization, E.H., V.L., A.M., T.T., T.V., P.J. and J.T.E.; Funding acquisition, E.H., J.T.E., P.J.; Methodology, E.H., V.L., A.M. and J.T.E.; Writing—original draft, E.H. (lead), V.L., A.M., T.T., T.V., P.J and J.T.E.; Writing—review & editing, E.H. (lead), V.L., A.M., T.T., T.V., P.J. and J.T.E.

Funding: This research was funded by the Kone Foundation, the Tiina and Antti Herlin Foundation and the Strategic Research Council at the Academy of Finland (312623/312663).

Acknowledgments: The authors would like to thank three anonymous reviewers for their helpful comments on the manuscript.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

References

1. World Economic Forum. The Global Risks Report 2019. Geneva. 2019. Available online: http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf (accessed on 8 March 2019).
2. Mora, C.; Spirandelli, D.; Franklin, E.C.; Lynham, J.; Kantar, M.B.; Miles, W.; Smith, C.Z.; Freel, K.; Moy, J.; Louis, L.V.; et al. Broad threat to humanity from cumulative climate hazards intensified by greenhouse gas emissions. *Nat. Clim. Chang.* **2018**, *8*, 1062. [CrossRef]
3. Barnett, J. Global Environmental Change and Human Security: An Introduction. In *Global Environmental Change and Human Security*; Matthew, R.A., Barnett, J., McDonald, B., O'Brien, K.L., Eds.; Massachusetts Institute of Technology: Cambridge, MA, USA, 2010.
4. Adger, W.N.; Pulhin, J.M.; Barnett, J.; Dabelko, G.D.; Hovelsrud, G.K.; Levy, M.; Oswald Spring, Ú.; Vogel, C.H.; Adams, H.; Hodbod, J. Human security. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Field, C.B., Barros, V.R., Dokken, D.J., Mach, K.J., Mastrandrea, M.D., Bilir, T.E., Chatterjee, M., Ebi, K.L., Estrada, Y.O., Genova, R.C., et al., Eds.; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2014; pp. 755–791.
5. Busby, J. Environmental security. In *The Oxford Handbook of International Security*; Gheciu, A., Wohlforth, W.C., Eds.; Oxford University Press: Oxford, UK, 2018; pp. 471–486.
6. Dalby, S. *Environmental Security*; Borderlines, Volume 20; University of Minnesota Press: Minneapolis, MN, USA; London, UK, 2002.
7. Koff, H. Reconciling competing globalizations through regionalisms? Environmental security in the framework of expanding security norms and narrowing security policies. *Globalizations* **2016**, *13*, 664–682. [CrossRef]
8. Vivekananda, J.; Schilling, J.; Mitra, S.; Pandey, N. On shrimp, salt and security: Livelihood risks and responses in South Bangladesh and East India. *Environ. Dev. Sustain.* **2014**, *16*, 1141–1161. [CrossRef]
9. Okpara, U.T.; Stringer, L.C.; Dougill, A.J.; Bila, M.D. Conflicts about water in Lake Chad: Are environmental, vulnerability and security issues linked? *Prog. Dev. Stud.* **2015**, *15*, 308–325. [CrossRef]
10. Dalby, S.; Moussavi, Z. Environmental security, geopolitics and the case of Lake Urmia's disappearance. *Glob. Chang. Peace Secur.* **2017**, *29*, 39–55. [CrossRef]
11. Dalby, S. Rethinking geopolitics: Climate security in the Anthropocene. *Glob. Policy* **2014**, *5*, 1–9. [CrossRef]
12. O'Neill, D.W.; Fanning, A.L.; Lamb, W.F.; Steinberger, J.K. A good life for all within planetary boundaries. *Nat. Sustain.* **2018**, *1*, 88–95. [CrossRef]
13. Geels, F.W.; Sovacool, B.K.; Schwanen, T.; Sorrell, S. Sociotechnical transitions for deep decarbonization. *Science* **2017**, *357*, 1242–1244. [CrossRef]
14. Chapin, F.S.; Pickett, S.T.; Power, M.E.; Jackson, R.B.; Carter, D.M.; Duke, C. Earth stewardship: A strategy for social–ecological transformation to reverse planetary degradation. *J. Environ. Stud. Sci.* **2011**, *1*, 44–53. [CrossRef]
15. Steffen, W.; Rockström, J.; Richardson, K.; Lenton, T.M.; Folke, C.; Liverman, D.; Summerhayes, C.P.; Barnosky, A.D.; Cornell, S.E.; Crucifix, M.; et al. Trajectories of the Earth System in the Anthropocene. *Proc. Natl. Acad. Sci. USA* **2018**, *115*, 8252–8259. [CrossRef]
16. Folke, C.; Biggs, R.; Norstrom, A.V.; Reyers, B.; Rockstrom, J. Social-ecological resilience and biosphere-based sustainability science. *Ecol. Soc.* **2016**, *21*, 41. [CrossRef]
17. Gregow, H.; Laaksonen, A.; Alper, M.E. Increasing large scale windstorm damage in Western, Central and Northern European forests, 1951–2010. *Sci. Rep.* **2017**, *7*, 46397. [CrossRef]
18. Mikkonen, S.; Laine, M.; Mäkelä, H.M.; Gregow, H.; Tuomenvirta, H.; Lahtinen, M.; Laaksonen, A. Trends in the average temperature in Finland, 1847–2013. *Stoch. Environ. Res. Risk Assess.* **2015**, *29*, 1521–1529. [CrossRef]
19. IPCC. *Climate Change 2013. The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2013.
20. Lindner, M.; Maroschek, M.; Netherer, S.; Kremer, A.; Barbati, A.; Garcia-Gonzalo, J.; Seidl, R.; Delzon, S.; Corona, P.; Kolström, M.; et al. Climate change impacts, adaptive capacity, and vulnerability of European forest ecosystems. *For. Ecol. Manag.* **2010**, *259*, 698–709. [CrossRef]

21. Barnett, J. *The Meaning of Environmental Security: Ecological Politics and Policy in the New Security Era*; Zed Books: London, UK; New York, NY, USA, 2001.
22. Brauch, H.G. *Threats, Challenges, Vulnerabilities and Risks in Environmental and Human Security*; UNU-EHS: Bonn, Germany, 2005.
23. Sygna, L.; O'Brien, K.; Wolf, J. (Eds.) *A Changing Environment for Human Security*; Routledge: London, UK; New York, NY, USA, 2013.
24. Homer-Dixon, T.F. Environmental scarcities and violent conflict: Evidence from cases. *Int. Secur.* **1994**, *19*, 5–40. [CrossRef]
25. Salehyan, I. From climate change to conflict? No consensus yet. *J. Peace Res.* **2008**, *45*, 315–326. [CrossRef]
26. Diehl, P. *Environmental Conflict: An Anthology*; Routledge: New York, NY, USA, 2018.
27. . Peluso, N.L.; Watts, M. (Eds.) *Violent Environments*; Cornell University Press: Ithaca, NY, USA, 2001.
28. Tir, J.; Diehl, P.F. Demographic Pressure and Interstate Conflict. In *Environmental Conflict*; Diehl, P.F., Gleditsch, N.P., Eds.; Westview Press: Boulder, CO, USA, 2001; pp. 58–83.
29. Price-Smith, A.T. *The Health of Nations: Infectious Disease, Environmental Change, and Their Effects on National Security and Development*; MIT Press: Cambridge, MA, USA, 2002.
30. Warner, K.; Hamza, M.; Oliver-Smith, A.; Renaud, F.; Julca, A. Climate change, environmental degradation and migration. *Nat. Hazards* **2010**, *55*, 689–715. [CrossRef]
31. Lujala, P.; Gleditsch, N.P.; Gilmore, E. A Diamond Curse? Civil War and a Lootable Resource. *J. Confl. Resolut.* **2005**, *49*, 538–562. [CrossRef]
32. Dinar, S. Resource Scarcity and Environmental Degradation: Analyzing International Conflict and Cooperation. In *Beyond Resource Wars: Scarcity, Environmental Degradation, and International Cooperation*; Dinar, S., Ed.; MIT Press: Cambridge, MA, USA; London, UK, 2011.
33. Brauch, H.G. *Environment and Human Security: Towards Freedom from Hazard Impacts*; UNU-EHS: Bonn, Germany, 2005.
34. Adger, W.N. Social and ecological resilience: Are they related? *Prog. Hum. Geogr.* **2000**, *24*, 347–364. [CrossRef]
35. Benzie, M.; Hedlund, J.; Carlsen, H. *Introducing the Transnational Climate Impacts Index: Indicators of Country-Level Exposure—Methodology Report*; Working Paper No. 2016-07; Stockholm Environment Institute: Stockholm, Sweden, 2016. Available online: http://indiaenvironmentportal.org.in/files/file/Introducing%20the%20Transnational%20Climate%20Impacts%20Index.pdf (accessed on 20 January 2019).
36. Deudney, D. The case against linking environmental degradation and national security. *Millennium* **1990**, *19*, 461–476. [CrossRef]
37. Aradau, C. Security and the democratic scene: Desecuritization and emancipation. *J. Int. Relat. Dev.* **2004**, *7*, 388–413. [CrossRef]
38. Bettini, G. Climate barbarians at the gate? A critique of apocalyptic narratives on 'climate refugees'. *Geoforum* **2013**, *45*, 63–72. [CrossRef]
39. Buzan, B.; Wæver, O.; De Wilde, J. *Security: A New Framework for Analysis*; Lynne Rienner Publishers: Boulder, CO, USA, 1998.
40. Trombetta, M.J. Environmental Security and climate change. Analyzing the Discourse. *Camb. Rev. Int. Aff.* **2008**, *21*, 585–602. [CrossRef]
41. Oels, A. Rendering climate change governable by risk: From probability to contingency. *Geoforum* **2013**, *45*, 17–29. [CrossRef]
42. Dalby, S. Climate change: New dimensions of environmental security. *RUSI J.* **2013**, *158*, 34–43. [CrossRef]
43. Arevalo, J.; Ochieng, R.; Mola-Yudego, B.; Gritten, D. Understanding bioenergy conflicts: Case of a jatropha project in Kenya's Tana Delta. *Land Use Policy* **2014**, *41*, 138–148. [CrossRef]
44. Carey, M.; French, A.; O'Brien, E. Unintended effects of technology on climate change adaptation: An historical analysis of water conflicts below Andean Glaciers. *J. Hist. Geogr.* **2012**, *38*, 181–191. [CrossRef]
45. Milman, A.; Arsano, Y. Climate adaptation and development: Contradictions for human security in Gambella, Ethiopia. *Glob. Environ. Chang.* **2014**, *29*, 349–359. [CrossRef]
46. Sawas, A.; Workman, R.; Mirumachi, N. *Climate Change, Low-Carbon Transitions and Security*; Grantham Institute Briefing Paper No 25; Grantham Institute, Imperial College London: London, UK, 2016.
47. Scheffran, J.; Battaglini, A. Climate and conflicts: The security risks of global warming. *Reg. Environ. Chang.* **2011**, *11*, 27–39. [CrossRef]

48. Briggs, C. Is solar geoengineering a national security risk? In *Geoengineering Our Climate?* Blackstock, J.J., Low, S., Eds.; Earthscan Routledge: London, UK; New York, NY, USA, 2018; pp. 202–206.
49. Maas, A.; Scheffran, J. Climate conflicts 2.0? Climate engineering as a challenge for international peace and security. *Secur. Peace* **2012**, *30*, 193–200. [CrossRef]
50. Netra, C.; Chong, D.; Conca, K.; Falk, R.; Gillespie, A.; Gupta, A.; Jinnah, S.; Kashwan, P.; Lahsen, M.; Light, A.; et al. *Governing Solar Radiation Management*; Forum for Climate Engineering Assessment, American University: Washington, DC, USA, 2018.
51. Corry, O. The international politics of geoengineering: The feasibility of Plan B for tackling climate change. *Secur. Dialogue* **2017**, *48*, 297–315. [CrossRef]
52. O'Brien, K. Are we missing the point? Global environmental change as an issue of human security. *Glob. Environ. Chang.* **2006**, *1*, 1–3. [CrossRef]
53. O'Brien, K.; Barnett, J. Global environmental change and human security. *Annu. Rev. Environ. Resour.* **2013**, *38*, 373–391. [CrossRef]
54. Dalby, S. Anthropocene formations: Environmental security, geopolitics and disaster. *Theory Cult. Soc.* **2017**, *34*, 233–252. [CrossRef]
55. De Wilde, J.H. Environmental security deconstructed. In *Globalization and Environmental Challenges*; Brauch, H.G., Oswald Spring, Ú., Mesjasz, C., Grin, J., Dunay, P., Behera, N.C., Chourou, B., Kameri-Mbote, P., Liotta, P.H., Eds.; Springer: Berlin/Heidelberg, Germany, 2008; pp. 595–602.
56. SOU. *Sverige inför Klimatförändringarna—Hot och Möjligheter*; Statens Officiella Utredningar: Stockholm, Sweden, 2007. Available online: https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2007/10/sou-200760-/ (accessed on 31 October 2018).
57. Swedish Civil Contingencies Agency. *Klimatförändringarnas Konsekvenser för Samhällsskydd och Beredskap—En Översikt. Report*; Swedish Civil Contingencies Agency: Stockholm, Sweden, 2012. Available online: https://www.msb.se/RibData/Filer/pdf/26173.pdf (accessed on 1 November 2018).
58. Swedish Meteorological and Hydrological Institute. Risker, konsekvenser och sårbarhet för samhället av förändrat klimat—en kunskapsöversikt. *Klimatologi*. October 2014. Available online: http://www.smhi.se/polopoly_fs/1.85414!/Menu/general/extGroup/attachmentColHold/mainCol1/file/Bilaga%201.pdf (accessed on 19 February 2019).
59. Mobjörk, M.; Johanssson, B. *Klimatförändringarnas Indirekta Effekter och Deras Betydelse för Sverige*; FOI Memo 5129; Stockholm Environment Institute: Stockholm, Sweden, 2014. Available online: https://www.smhi.se/polopoly_fs/1.85416!/Menu/general/extGroup/attachmentColHold/mainCol1/file/Bilaga%203-5.pdf (accessed on 30 March 2019).
60. Prime Minister's Office. Ilmastonmuutoksen Heijastevaikutukset Suomeen. Government Report; 2016. Available online: http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79783/Ilmastomuutoksen%20heijastevaikutukset%20Suomeen.pdf (accessed on 31 October 2018).
61. Prime Minister's Office. Sää-ja Ilmastoriskit Suomessa—Kansallinen Arvio. Government Report; 2018. Available online: http://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/161015/43-2018-Saa%20ja%20ilmastoriskit%20Suomessa.pdf (accessed on 1 November 2018).
62. Government Offices of Sweden. *Sweden's Seventh National Communication on Climate Change*; Ministry of the Environment and Energy: Stockholm, Sweden, 2017. Available online: https://unfccc.int/files/national_reports/annex_i_natcom_/application/pdf/6950713_sweden-nc7-1-swe_nc7_20171222.pdf (accessed on 30 March 2019).
63. Statistics Finland. *Finland's Seventh National Communication on Climate Change*; Statistics Finland: Helsinki, Finland, 2017. Available online: https://www.stat.fi/static/media/uploads/tup/khkinv/VII_Climate_Change_16102017.pdf (accessed on 30 March 2019).
64. Prime Minister's Office. Keinot Edistää sää—ja Ilmastoriskien Hallintaa. Government Report; 2016. Available online: https://tietokayttoon.fi/documents/10616/2009122/47_Keinot+edist%C3%A4%C3%A4+s%C3%A4%C3%A4-+ja+ilmastoriskien+hallintaa/2494b562-b446-4884-bc85-0ade9d4b8cf1?version=1.0 (accessed on 22 November 2018).
65. City of Helsinki. *Sään ja Ilmastonmuutoksen Aiheuttamat Riskit Helsingissä*; Kaupunkiympäristön Julkaisuja 6:2018; City of Helsinki: Helsinki, Finland, 2018. Available online: https://www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisut/julkaisu-06-18.pdf (accessed on 30 March 2019).

66. Swedish Energy Agency. *Drivers and Barriers for a Transition to a Sustainable Energy System*; For Growth Analysis; Swedish Energy Agency: Frösön, Sweden, 2014. Available online: http://www.tillvaxtanalys.se/download/18.201965214d8715afd1147e4/1432551725744/pm_2014_14+Drivers+and+Barriers+for+a+Transition+to+a+sustainable+energy+system.pdf (accessed on 30 January 2019).
67. Finnish Climate Change Panel. Ilmastonmuutos ja Metsätuhot—Analyysi Ilmaston Lämpenemisen Seurauksista Suomessa. Suomen Ilmastopaneeli 1/2019. Available online: https://www.ilmastopaneeli.fi/wp-content/uploads/2019/01/Ilmastopaneeli_Mets%C3%A4tuhoraportti_tiivistelm%C3%A4-1.pdf (accessed on 26 February 2019).
68. Bündnis Entwicklung Hilft. World Risk Report Analysis and Prospects 2017. Report. 2017. Available online: https://reliefweb.int/sites/reliefweb.int/files/resources/WRR_2017_E2.pdf (accessed on 26 October 2018).
69. The Hongkong and Shanghai Banking Corporation (HSBC). *Fragile Planet. Scoring Climate Risks around the World*; HSBC: Hong Kong, China, 2018. Available online: https://www.eenews.net/assets/2018/03/21/document_cw_01.pdf (accessed on 26 October 2018).
70. Juhola, S.; Peltonen, L.; Niemi, P. The ability of Nordic countries to adapt to climate change: Assessing adaptive capacity at the regional level. *Local Environ.* **2012**, *17*, 717–734. [CrossRef]
71. Hakala, E.; Lähde, V.; Majava, A.; Toivanen, T.; Vadén, T.; Järvensivu, P.; Eronen, J.T. A lot of talk, but little action—The blind spots of Nordic environmental security policy. *Sustainability* **2019**.
72. Hallding, K.; Adams, K.M.; Erikson, A.; Kemp-Benedict, E.; Skånberg, K. *The Stockholm Geopolitics Scenarios*; Mistra Geopolitics, Stockholm Environment Institute: Stockholm, Sweden, 2018. Available online: https://www.mistra-geopolitics.se/wp-content/uploads/2018/12/Hallding-et-al_2018_The-Stockholm-Geopolitics-Scenarios_Draft-Briefing.pdf (accessed on 28 January 2019).
73. Mistra Geopolitics. Publications. Website. 2018. Available online: https://www.mistra-geopolitics.se/our-research/#publications (accessed on 20 January 2019).
74. Burke, M.W.; Davis, W.M.; Diffenbaugh, N.S. Large potential reduction in economic damages under UN mitigation targets. *Nature* **2018**, *557*, 549. [CrossRef]
75. Executive Summary. In *Arctic Report Card*; Osborne, E.; Richter-Menge, J.; Jeffries, M. (Eds.) Arctic Program, 2018. Available online: https://www.arctic.noaa.gov/Report-Card (accessed on 30 March 2019).
76. Käpylä, J.; Mikkola, H. The promise of the geoeconomic Arctic: A critical analysis. *Asia Eur. J.* **2016**, *14*, 203–220. [CrossRef]
77. International Renewable Energy Agency (IRENA). *A New World: The Geopolitics of the Energy Transformation*; IRENA: Abu Dhabi, UAE, 2019. Available online: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/Global_commission_geopolitics_new_world_2019.pdf (accessed on 29 January 2019).
78. Finnish Ministry of Economic Affairs and Employment. Government Report on the National Energy and Climate Strategy for 2030. Government Report; 2017. Available online: https://tem.fi/strategia2016 (accessed on 30 January 2019).
79. Tynkkynen, V.-P.; Pynnöniemi, K.; Höysniemi, S. Global Energy Transitions and Russia's Energy Influence in Finland. Policy Brief 19/2017. Available online: https://tietokayttoon.fi/julkaisu?pubid=23101 (accessed on 30 January 2019).
80. Järvensivu, P.; Toivanen, T.; Vadén, T.; Lähde, V.; Majava, A.; Eronen, J.T. Global Sustainable Development Report 2019 Drafted by the Group of Independent Scientists. Invited Background Document on Economic Transformation, to Chapter: Transformation: The Economy. 2018. Available online: http://bios.fi/bios-governance_of_economic_transition.pdf (accessed on 1 February 2018).